## SEQUENCE LISTING

<110> Kodali, Dharma Fan, Zhegong DeBonte, Lorin R. <120> PLANTS, SEEDS AND OILS HAVING AN ELEVATED TOTAL MONOUNSATURATED FATTY ACID CONTENT <130> 07148-072002 <150> US 09/128,602 <151> 1998-08-03 <160> 68 <170> FastSEQ for Windows Version 4.0 <210> 1 <211> 1155 <212> DNA <213> Brassica napus <220> <221> CDS <222> (1)...(1152) <223> Wild type Fad2 <221> misc\_feature <222> 205  $\langle 223 \rangle$  n = a, g, c, or t <400> 1 atg ggt gca ggt gga aga atg caa gtg tet eet eec tee aag aag tet 48 Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser 15 5 1 gaa acc gac acc atc aag cgc gta ccc tgc gag aca ccg ccc ttc act 96 Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr 25 gtc gga gaa ctc aag aaa gca atc cca ccg cac tgt ttc aaa cgc tcg 144 Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser 35 atc cct cgc tct ttc tcc tac ctc atc tgg gac atc atc ata gcc tcc 192 Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser 55 50 tgc ttc tac tac ntc gcc acc act tac ttc cct ctc ctc cct cac cct 240 Cys Phe Tyr Tyr Xaa Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro

75

|                   |                   |                   |            |                   |                   |                   |                   |            | 2                 | ?                 |                   |                   |            |                  |                   | •  |      |   |            |    |   |
|-------------------|-------------------|-------------------|------------|-------------------|-------------------|-------------------|-------------------|------------|-------------------|-------------------|-------------------|-------------------|------------|------------------|-------------------|----|------|---|------------|----|---|
|                   |                   |                   |            | _                 |                   |                   |                   |            |                   |                   |                   |                   |            | tgc<br>Cys<br>95 |                   |    | 288  |   |            |    |   |
|                   |                   |                   |            | Trp               |                   |                   |                   |            |                   |                   |                   |                   |            | gcc<br>Ala       |                   |    | 336  |   | . <u>.</u> |    | ٠ |
|                   |                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            | cac<br>His       |                   | -  | 384  |   |            |    |   |
|                   |                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            | agc<br>Ser       |                   |    | 432  |   |            |    |   |
|                   |                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            | ccc<br>Pro       |                   |    | 480  |   | •          |    |   |
|                   |                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            | Pro<br>175       |                   |    | 528  |   | ,          |    |   |
|                   |                   |                   |            |                   |                   |                   | Val               |            |                   |                   |                   |                   |            | ccg<br>Pro       |                   |    | 57.6 |   |            | -  |   |
|                   |                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            | ttc<br>Phe       | cgt<br>Arg        |    | 624  |   |            |    |   |
| tgc<br>Cys        | cat<br>His<br>210 | ttc<br>Phe        | cac<br>His | Pro               | aac<br>Asn        | gct<br>Ala<br>215 | ccc<br>Pro        | atc<br>Ile | tac<br>Tyr        | aac<br>Asn        | gac<br>Asp<br>220 | cgc<br>Arg        | gag<br>Glu | cgt<br>Arg       | ctc<br>Leu        |    | 672  |   |            |    |   |
| cag<br>Gln<br>225 | Ile               | tac<br>Tyr        | atc<br>Ile | tcc<br>Ser        | gac<br>Asp<br>230 | gct<br>Ala        | ggc<br>Gly        | atc<br>Ile | ctc<br>Leu        | gcc<br>Ala<br>235 | gtc<br>Val        | tgc<br>Cys        | tac<br>Tyr | ggt<br>Gly       | ctc<br>Leu<br>240 | ٠. | 720  |   |            | ٠. |   |
| ttc<br>Phe        | cgt<br>Arg        | tac<br>Tyr        | gcc<br>Ala | gcc<br>Ala<br>245 | ggc<br>Gly        | ċag<br>Gln        | gga<br>Gly        | gtg<br>Val | gcc<br>Ala<br>250 | tcg<br>Ser        | atg<br>Met        | gtc<br>Val        | tgc<br>Cys | Phe<br>255       | tac<br>Tyr        |    | 768  |   |            |    |   |
|                   |                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            | act<br>Thr       |                   |    | 816  | • |            |    |   |
| ttg<br>Leu        | cag<br>Gln        | cac<br>His<br>275 | acg<br>Thr | cat<br>His        | cct<br>Pro        | tcc<br>Ser        | ctg<br>Leu<br>280 | cct<br>Pro | cac<br>His        | tac<br>Tyr        | gat<br>Asp        | tcg<br>Ser<br>285 | tcc<br>Ser | gag<br>Glu       | tgg<br>Trp        |    | 864  |   |            |    |   |

|            |                   |            |            |            |            |                   |            |            | •          |                   |                   |            |            |            |            |      |  |
|------------|-------------------|------------|------------|------------|------------|-------------------|------------|------------|------------|-------------------|-------------------|------------|------------|------------|------------|------|--|
|            |                   |            |            |            |            |                   |            |            |            | gac<br>Asp        |                   |            |            |            |            | 912  |  |
|            |                   |            |            |            |            |                   |            |            |            | acg<br>Thr<br>315 |                   |            |            |            |            | 960  |  |
| ccg<br>Pro |                   |            |            |            |            |                   |            |            |            | atg<br>Met        |                   |            |            |            |            | 1008 |  |
|            |                   |            |            |            |            |                   |            |            |            | ttc<br>Phe        |                   |            |            |            |            | 1056 |  |
|            |                   |            |            |            |            |                   |            |            |            | tgt<br>Cys        |                   |            | Val        |            |            | 1104 |  |
| gac<br>Asp | agg<br>Arg<br>370 | caa<br>Gln | ggt<br>Gly | gag<br>Glu | aag<br>Lys | aaa<br>Lys<br>375 | ggt<br>Gly | gtg<br>Val | ttc<br>Phe | tgg<br>Trp        | tac<br>Tyr<br>380 | aac<br>Asn | aat<br>Asn | aag<br>Lys | tta<br>Leu | 1152 |  |
| tga        |                   |            |            |            | ,          |                   | -          |            | •          |                   |                   |            |            |            |            | 1155 |  |
| <212       | .> 38<br>?> PF    | <b>T</b>   | lca n      | napus      | 3          |                   |            |            |            |                   |                   |            |            |            |            |      |  |

<223> Xaa = Phe, Leu, Ile, or Val

Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser 10 Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser Cys Phe Tyr Tyr Xaa Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro 75 Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val 85 90 Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe

105

Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser 120

Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Ser His 135 130

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His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
                     150
                                         155
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                                     170
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
             180
                                 185
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Arg
                             200
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
                                             220
                         215
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
                                         235
Phe Arg Tyr Ala Ala Gly Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                245
                                     250
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                                                     270
            260
                                 265
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
                             280
Asp Trp Phe Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
                         295
                                             300
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
                    310
                                         315
Pro Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                                     330
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
                                 345
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
                             360
                                                 365
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
                                             380
    370
                         375
<210> 3
<211> 1155
<212> DNA
<213> Brassica napus
<220>
<221> CDS
<222> (1)...(1152)
<223> g to a transversion mutation at nucleotide 316
<221> misc feature
<222> 205
<223> n = a, g, c, or t/u
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                                                                        48
atg ggt gca ggt gga aga atg caa gtg tct cct ccc tcc aag aag tct
Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser
                                                                        96
gaa acc gac acc atc aag cgc gta ccc tgc gag aca ccg ccc ttc act
Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr
             20
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|                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            |                   | cgc<br>Arg        |                   |   | 144 |
|-------------------|-------------------|------------|-------------------|-------------------|-------------------|-------------------|------------|-------------------|-------------------|-------------------|-------------------|------------|-------------------|-------------------|-------------------|---|-----|
|                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            |                   | gcc<br>Ala        |                   |   | 192 |
|                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            |                   | cac<br>His        |                   |   | 240 |
|                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            |                   | tgc<br>Cys<br>95  |                   |   | 288 |
|                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            |                   | gcc<br>Ala        |                   |   | 336 |
|                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            |                   | cac<br>His        |                   |   | 384 |
|                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            |                   | agc<br>Ser        |                   |   | 432 |
|                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            |                   | ccc<br>Pro        |                   |   | 480 |
| aag<br>Lys        | aag<br>Lys        | tca<br>Ser | gac<br>Asp        | atc<br>Ile<br>165 | aag<br>Lys        | tgg<br>Trp        | tac<br>Tyr | ggc<br>Gly        | aag<br>Lys<br>170 | tac<br>Tyr        | ctc<br>Leu        | aac<br>Asn | aac<br>Asn        | cct<br>Pro<br>175 | ttg<br>Leu        |   | 528 |
| gga<br>Gly        | cgc<br>Arg        | acc<br>Thr | gtg<br>Val<br>180 | atg<br>Met        | tta<br>Leu        | acg<br>Thr        | gtt<br>Val | cag<br>Gln<br>185 | ttc<br>Phe        | act<br>Thr        | ctc<br>Leu        | ggc<br>Gly | tgg<br>Trp<br>190 | ccg<br>Pro        | ttg<br>Leu        |   | 576 |
|                   |                   |            |                   |                   |                   |                   |            |                   |                   |                   |                   |            |                   | ttc<br>Phe        |                   |   | 624 |
| tgc<br>Cys        | cat<br>His<br>210 | Phe        | cac<br>His        | ccc<br>Pro        | aac<br>Asn        | gct<br>Ala<br>215 | ccc<br>Pro | atc<br>Ile        | tac<br>Tyr        | aac<br>Asn        | gac<br>Asp<br>220 | cgc<br>Arg | gag<br>Glu        | cgt<br>Arg        | ctc<br>Leu        | · | 672 |
| cag<br>Gln<br>225 | ata<br>Ile        | tac<br>Tyr | atc<br>Ile        | tcc<br>Ser        | gac<br>Asp<br>230 | gct<br>Ala        | ggc<br>Gly | atc<br>Ile        | ctc<br>Leu        | gcc<br>Ala<br>235 | gtc<br>Val        | tgc<br>Cys | tac<br>Tyr        | ggt<br>Gly        | ctc<br>Leu<br>240 |   | 720 |

|     | cgt<br>Arg        |  |  |     |     |  |  |            | 768  |
|-----|-------------------|--|--|-----|-----|--|--|------------|------|
|     | gtc<br>Val        |  |  |     |     |  |  |            | 816  |
|     | cag<br>Gln        |  |  |     |     |  |  |            | 864  |
|     | tgg<br>Trp<br>290 |  |  |     |     |  |  | atc<br>Ile | 912  |
|     | aac<br>Asn        |  |  |     |     |  |  |            | 960  |
|     | ttc<br>Phe        |  |  |     |     |  |  |            | 1008 |
|     | aag<br>Lys        |  |  | Tyr | Gln |  |  |            | 1056 |
|     | aag<br>Lys        |  |  |     |     |  |  |            | 1104 |
|     | agg<br>Arg<br>370 |  |  |     |     |  |  |            | 1152 |
| tga |                   |  |  |     |     |  |  | ٠          | 1155 |

<210> 4 <211> 384

<212> PRT

<213> Brassica napus

<220>

<223> Xaa = Phe, Leu, Ile, or Val

<400> 4

 Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser 1
 5
 1
 10
 15
 15
 15

 Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Pro Pro Ser Lys Arg Val Pro Cys Glu Thr Pro Pro Pro Pro Pro Ser Lys Arg Ser 35
 25
 25
 30
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Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser
Cys Phe Tyr Tyr Xaa Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro
                     70
                                         75
Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val
Leu Thr Gly Val Trp Val Ile Ala His Lys Cys Gly His His Ala Phe
                                105
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser
        115
                            120
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Ser His
                        135
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys
                    150
                                        155
Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu
                                    170
                165
Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu
                                185
                                                    190
            180
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Arg
                            200
Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu
                        215
Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu
                                        .235
                    230
Phe Arg Tyr Ala Ala Gly Gln Gly Val Ala Ser Met Val Cys Phe Tyr
                                    250
                245
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
            260
                                265
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
                            280
Asp Trp Phe Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile
                        295
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
                    310
                                        315
Pro Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                                    330
                325
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
            340
                                345
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
                            360
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
                        375
    370
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<210> 5

<211> 1155

<212> DNA

<213> Brassica napus

<220>

<221> CDS

<222> (1) ... (1152)

<223> Wild type Fad2

| <401 | 0> 5 |   |   |                   |     |   |   |   |  |   |   | -   |
|------|------|---|---|-------------------|-----|---|---|---|--|---|---|-----|
| atg  | ggt  |   |   | aga<br>Arg        |     |   |   |   |  |   |   | 48  |
| -    |      | - |   | aag<br>Lys        | _   | _ |   |   |  |   |   | 96  |
| -    |      | _ | - | aaa<br>Lys        | _   |   | - | _ |  | - | _ | 144 |
|      |      |   |   | tcc<br>Ser        |     |   |   |   |  |   |   | 192 |
| -    |      |   | _ | gcc<br>Ala<br>70  |     |   |   |   |  |   |   | 240 |
|      |      |   | - | tgg<br>Trp        |     |   |   |   |  |   |   | 288 |
|      |      |   |   | gtc<br>Val        |     |   |   |   |  |   |   | 336 |
|      |      |   |   | ctg<br>Leu        |     |   |   |   |  |   |   | 384 |
|      |      |   |   | tac<br>Tyr        |     |   |   |   |  |   |   | 432 |
|      |      |   |   | tcc<br>Ser<br>150 |     |   |   |   |  |   |   | 480 |
|      |      |   |   | aag<br>Lys        |     |   |   |   |  |   |   | 528 |
|      |      |   |   | tta<br>Leu        |     |   |   |   |  |   |   | 576 |
|      |      |   |   | gtc<br>Val        | Ser |   |   |   |  |   |   | 624 |
|      |      |   |   |                   |     |   |   |   |  |   |   |     |

|            |                   |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |                   | cgt<br>Arg        |            |   | 672  |
|------------|-------------------|-------------------|-------------------|------------|------------|-------------------|-------------------|-------------------|------------|------------|-------------------|-------------------|-------------------|-------------------|------------|---|------|
|            |                   |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |                   | ggt<br>Gly        |            |   | 720  |
|            |                   |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |                   | ttc<br>Phe<br>255 |            |   | 768  |
|            |                   |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |                   | act<br>Thr        |            |   | 816  |
|            |                   |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |                   | gag<br>Glu        |            | • | 864  |
| gat<br>Asp | tgg<br>Trp<br>290 | ttg<br>Leu        | agg<br>Arg        | gga<br>Gly | gct<br>Ala | ttg<br>Leu<br>295 | gcc<br>Ala        | acc<br>Thr        | gtt<br>Val | gac<br>Asp | aga<br>Arg<br>300 | gac<br>Asp        | tac<br>Tyr        | gga<br>Gly        | atc<br>Ile |   | 912  |
|            |                   |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |                   | cat<br>His        |            |   | 960  |
|            |                   |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |                   | aag<br>Lys<br>335 |            |   | 1008 |
| ata<br>Ile | aag<br>Lys        | ccg<br>Pro        | ata<br>Ile<br>340 | ctg<br>Leu | gga<br>Gly | gag<br>Glu        | tat<br>Tyr        | tat<br>Tyr<br>345 | cag<br>Gln | ttg<br>Leu | cat<br>His        | ggg<br>Gly        | acg<br>Thr<br>350 | ccg<br>Pro        | gtg<br>Val |   | 1056 |
| gtt<br>Val | aag<br>Lys        | gcg<br>Ala<br>355 | atg<br>Met        | tgg<br>Trp | agg<br>Arg | gag<br>Glu        | gcg<br>Ala<br>360 | aag<br>Lys        | gag<br>Glu | tgt<br>Cys | atc<br>Ile        | tat<br>Tyr<br>365 | gtg<br>Val        | gaa<br>Glu        | ccg<br>Pro |   | 1104 |
| gac<br>Asp | agg<br>Arg<br>370 | caa<br>Gln        | ggt<br>Gly        | gag<br>Glu | aag<br>Lys | aaa<br>Lys<br>375 | ggt<br>Gly        | gtg<br>Val        | ttc<br>Phe | tgg<br>Trp | tac<br>Tyr<br>380 | aac<br>Asn        | aat<br>Asn        | aag<br>Lys        | tta<br>Leu |   | 1152 |
| tga        |                   |                   |                   |            |            |                   |                   |                   |            |            |                   | •                 |                   |                   |            |   | 1155 |

<210> 6

<211> 384

<212> PRT

<213> Brassica napus

Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr 25 Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe 105 Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser 120 Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His 135 130 His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu 165 170 Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu 180 185 Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala 200 Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu 215 Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu 230 235 Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr 245 250 Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr 265 260 Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp 280 Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile 300 295 Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His 310 315 Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala 330 325 Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Leu His Gly Thr Pro Val Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro 360 Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu 375 370

<210> 7

<sup>&</sup>lt;211> 1155

<sup>&</sup>lt;212> DNA

<sup>&</sup>lt;213> Brassica napus

| <220> <221> CDS <222> (1)(1152) <223> T to A transver   | csion mutation                          | at nucleotide 515                               |                                       |
|---|---|---|---------------------------------------|
| <400> 7 atg ggt gca ggt gga a Met Gly Ala Gly Gly A 1 5 |   |   |                                       |
| gaa acc gac aac atc a<br>Glu Thr Asp Asn Ile I<br>20    |   |   |                                       |
| gtc gga gaa ctc aag a<br>Val Gly Glu Leu Lys I<br>35    |   |   |                                       |
| atc cct cgc tct ttc t<br>Ile Pro Arg Ser Phe S          |   |   |                                       |
| tgc ttc tac tac gtc g<br>Cys Phe Tyr Tyr Val A<br>65    |   |   |                                       |
| ctc tcc tac ttc gcc t<br>Leu Ser Tyr Phe Ala T<br>85    |   |   |                                       |
| cta acc ggc gtc tgg g<br>Leu Thr Gly Val Trp V<br>100   | tc ata gcc cac<br>al Ile Ala His<br>105 | Glu Cys Gly His H                               | cac gcc ttc 336<br>His Ala Phe<br>.10 |
| agc gac tac cag tgg c<br>Ser Asp Tyr Gln Trp I<br>115   |   |   |                                       |
| ttc ctc ctc gtc cct t<br>Phe Leu Leu Val Pro T<br>130   |   |   |                                       |
| cat tcc aac act ggc t<br>His Ser Asn Thr Gly S<br>145   | cc ctc gag aga<br>er Leu Glu Arg<br>50  | gac gaa gtg ttt g<br>Asp Glu Val Phe V<br>155   | gtc ccc aag 480<br>Val Pro Lys<br>160 |
| aag aag tca gac atc a<br>Lys Lys Ser Asp Ile I<br>165   | ag tgg tac ggc<br>ys Trp Tyr Gly        | aag tac cac aac a<br>Lys Tyr His Asn A<br>170 . | ac cct ttg 528<br>Asn Pro Leu<br>175  |
| gga cgc acc gtg atg t<br>Gly Arg Thr Val Met L<br>180   | ta acg gtt cag<br>eu Thr Val Gln<br>185 | Phe Thr Leu Gly T                               | gg cct ttg 576<br>Trp Pro Leu         |

|            | c tta<br>r Leu      |                   | Phe        |                   |            |                   |                   |            |                   |            |                   |                   |            |                   |            | 624  |
|------------|---------------------|-------------------|------------|-------------------|------------|-------------------|-------------------|------------|-------------------|------------|-------------------|-------------------|------------|-------------------|------------|------|
|            | c cat<br>His<br>210 | Phe               |            |                   |            |                   |                   |            |                   |            |                   |                   |            |                   |            | 672  |
|            | g ata<br>n Ile      |                   |            |                   |            |                   |                   |            |                   |            |                   |                   |            |                   |            | 720  |
| tak<br>Tyi | c cgc<br>Arg        | tac<br>Tyr        | gct<br>Ala | gct<br>Ala<br>245 | gtc<br>Val | caa<br>Gln        | gga<br>Gly        | gtt<br>Val | gcc<br>Ala<br>250 | tcg<br>Ser | atg<br>Met        | gtc<br>Val        | tgc<br>Cys | ttc<br>Phe<br>255 | Tyr        | 768  |
|            | a gtt<br>7 Val      |                   |            |                   |            |                   |                   |            |                   |            |                   |                   |            |                   |            | 816  |
|            | g cag<br>l Gln      |                   |            |                   |            |                   |                   |            |                   |            |                   |                   |            |                   |            | 864  |
|            | tgg<br>Trp<br>290   |                   |            |                   |            |                   |                   |            |                   |            |                   |                   |            |                   |            | 912  |
|            | aac<br>Asn          |                   |            |                   |            |                   |                   |            |                   |            |                   |                   |            |                   |            | 960  |
|            | ttc<br>Phe          |                   |            |                   |            |                   |                   |            |                   |            |                   |                   |            |                   |            | 1008 |
|            | aag<br>Lys          |                   |            |                   |            |                   |                   |            |                   |            |                   |                   |            |                   |            | 1056 |
| gtt<br>Val | aag<br>Lys          | gcg<br>Ala<br>355 | atg<br>Met | tgg<br>Trp        | agg<br>Arg | gag<br>Glu        | gcg<br>Ala<br>360 | aag<br>Lys | gag<br>Glu        | tgt<br>Cys | atc<br>Ile        | tat<br>Tyr<br>365 | gtg<br>Val | gaa<br>Glu        | ccg<br>Pro | 1104 |
| gac<br>Asp | agg<br>Arg<br>370   | caa<br>Gln        | ggt<br>Gly | gag<br>Glu        | aag<br>Lys | aaa<br>Lys<br>375 | ggt<br>Gly        | gtg<br>Val | ttc<br>Phe        | tgg<br>Trp | tac<br>Tyr<br>380 | aac<br>Asn        | aat<br>Asn | aag<br>Lys        | tta<br>Leu | 1152 |
| tga        |                     |                   |            |                   |            |                   |                   |            |                   |            | •                 |                   |            |                   |            | 1155 |

<210> 8 <211> 384 <212> PRT <213> Brassica napus

<400> 8 Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser 40 Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Pro His Pro 70 Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe 105 100 Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser 120 Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His 135 His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys 155 150 Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr His Asn Asn Pro Leu 170 165 Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu 185 Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala 200 Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu 215 Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu 235 230 Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr 250 245 Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr 265 260 Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp 280 Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile 295 Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His 315 Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala 330 Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Leu His Gly Thr Pro Val 345 Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro 360 Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu 375 370

| <210> 9<br><211> 1155<br><212> DNA<br><213> Brassica nap | us  |   |                        |
|--|---|---|------------------------|
| <220><br><221> CDS<br><222> (1)(1152)                    |   |   |                        |
| Met Gly Ala Gly Gl                                       |   | tct cct ccc tcc aaa<br>Ser Pro Pro Ser Lys<br>10  |                        |
|  |   | tgc gag aca ccg ccc<br>Cys Glu Thr Pro Pro<br>30  |                        |
|  |   | ccg cac tgt ttc aaa<br>Pro His Cys Phe Lys.<br>45 |                        |
|  |   | tgg gac atc atc ata<br>Trp Asp Ile Ile Ile<br>60  |                        |
|  |   | ttc cct ctc ctc cct<br>Phe Pro Leu Leu Pro<br>75  |                        |
|  | a Trp Pro Leu Tyr                             | tgg gcc tgc cag ggc<br>Trp Ala Cys Gln Gly<br>90  |                        |
|  |   | gag tgc ggc cac cac<br>Glu Cys Gly His His<br>110 |                        |
| agc gac tac cag tgo<br>Ser Asp Tyr Gln Trp<br>115        | g ctg gac gac acc<br>o Leu Asp Asp Thr<br>120 | gtc ggc ctc atc ttc<br>Val Gly Leu Ile Phe<br>125 | cac tcc 384<br>His Ser |
|  |   | aag tac agt cat cga<br>Lys Tyr Ser His Arg<br>140 |                        |
|  |   | gac gaa gtg ttt gtc<br>Asp Glu Val Phe Val<br>155 |                        |
|  | Lys Trp Tyr Gly                               | aag tac ctc aac aac<br>Lys Tyr Leu Asn Asn<br>170 |                        |

|            |                   |            |            |            |            | acg<br>Thr        |            |            |            |            |                   |            |            |            | ttg<br>Leu | . 57 | 6  |
|------------|-------------------|------------|------------|------------|------------|-------------------|------------|------------|------------|------------|-------------------|------------|------------|------------|------------|------|----|
|            |                   |            |            |            |            | tcg<br>Ser        |            |            |            |            |                   |            |            |            |            | 62   | 4  |
|            |                   |            |            |            |            | gct<br>Ala<br>215 |            |            |            |            |                   |            |            |            |            | 67   | 2  |
|            |                   |            |            |            |            | gct<br>Ala        |            |            |            |            |                   |            |            |            |            | 72   | 0  |
| Tyr        | Arg               | Tyr        | Ala        | Ala<br>245 | Val        | caa<br>Gln        | Gly        | Val        | Ala<br>250 | Ser        | Met               | Val        | Cys        | Phe<br>255 | Ţyr        | 76   | 8  |
| Gly        | Val               | Pro        | Leu<br>260 | Leu        | Ile        | gtc<br>Val        | Asn        | Gly<br>265 | Phe        | Leu        | Val               | Leu        | Ile<br>270 | Thr        | Tyr        | 81   | .6 |
| Leu        | Gln               | His<br>275 | Thr        | His        | Pro        | Ser               | Leu<br>280 | Pro        | His        | Tyr        | Asp               | Ser<br>285 | Ser        | Glu        |            |      |    |
| Asp        | Trp<br>290        | Leu        | Arg        | Gly        | Ala        | Leu<br>295        | Ala        | Thr        | Val        | Asp        | Arg<br>300        | Asp        | Tyr        | Gly        | Ile        | 91   | .2 |
|            |                   |            |            |            |            | aat<br>Asn        |            |            |            |            |                   |            |            |            |            | 96   | 50 |
| Leu        | Phe               | Ser        | Thr        | Met<br>325 | Pro        | cat<br>His        | Tyr        | His        | Ala<br>330 | Met        | Glu               | Ala        | Thr        | Lys<br>335 | Ala        | 100  |    |
| Ile        | Lys               | Pro        | Ile<br>340 | Leu        | Gly        | gag<br>Glu        | Tyr        | Tyr<br>345 | Gln        | Phe        | Asp               | Gly        | Thr<br>350 | Pro        | Val        | 105  |    |
| Val        | Lys               | Ala<br>355 | Met        | Trp        | Arg        | gag<br>Glu        | Ala<br>360 | Lys        | Glu        | Cys        | Ile               | Tyr<br>365 | Val        | Glu        | Pro        | 110  |    |
| gac<br>Asp | agg<br>Arg<br>370 | caa<br>Gln | ggt<br>Gly | gag<br>Glu | aag<br>Lys | aaa<br>Lys<br>375 | ggt<br>Gly | gtg<br>Val | ttc<br>Phe | tgg<br>Trp | tac<br>Tyr<br>380 | aac<br>Asn | aat<br>Asn | aag<br>Lys | tta<br>Leu | 115  |    |
| tga        |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            |            | 115  | 5  |

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<210> 10
<211> 384
<212> PRT
<213> Brassica napus
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<400> 10 Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro 70 Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe 105 Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser 120 Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His 135 His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys 155 150 Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu 170 Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala 200 Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu 215 Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu 230 235 Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr 245 Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr 265 Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp 280 Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile 295 Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His 315 310 Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala 325 330 Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val 345 Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro 360 Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu 380

3.75

| <210> 11<br><211> 1155<br><212> DNA<br><213> Brassica napu | ıs                                      |   |                                       |
|--|---|---|---------------------------------------|
| <220> <221> CDS <222> (1)(1152)                            |   |   |                                       |
| <400> 11 atg ggt gca ggt gga Met Gly Ala Gly Gly 1         | Arg Met Gln V                           |   |                                       |
| gaa acc gac aac atc<br>Glu Thr Asp Asn Ile<br>20           | Lys Arg Val P                           |   |                                       |
| gtc gga gaa ctc aag<br>Val Gly Glu Leu Lys<br>35           |   |   |                                       |
| atc cct cgc tct ttc<br>Ile Pro Arg Ser Phe<br>50           |   |   |                                       |
| tgc ttc tac tac gtc<br>Cys Phe Tyr Tyr Val<br>65           |   |   |                                       |
| ctc tcc tac ttc gcc<br>Leu Ser Tyr Phe Ala<br>85           | Trp Pro Leu Ty                          |   |                                       |
| cta acc ggc gtc tgg<br>Leu Thr Gly Val Trp<br>100          | Val Ile Ala H                           |   |                                       |
| agc gac tac cag tgg<br>Ser Asp Tyr Gln Trp<br>115          |   |   |                                       |
| ttc ctc ctc gtc cct<br>Phe Leu Leu Val Pro<br>130          |   |   |                                       |
| cat tcc aac act ggc<br>His Ser Asn Thr Gly<br>145          | tcc ctc gag ag<br>Ser Leu Glu An<br>150 | ga gac gaa gtg ttt<br>rg Asp Glu Val Phe<br>155 | gtc ccc aag 480<br>Val Pro Lys<br>160 |
| aag aag tca gac atc<br>Lys Lys Ser Asp Ile<br>165          | Lys Trp Tyr G                           |   |                                       |

|            | cgc<br>Arg        |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 576  |
|------------|-------------------|-------------------|------------|------------|------------|------------|-------------------|------------|------------|------------|------------|-------------------|------------|------------|------------|------|
|            | tta<br>Leu        |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 624  |
|            | cat<br>His<br>210 |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 672  |
|            | ata<br>Ile        |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 720  |
|            | cgc<br>Arg        |                   |            |            |            |            |                   | Val        |            |            |            |                   | .Cys       |            |            | 768  |
|            | gtt<br>Val        |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 816  |
|            | cag<br>Gln        |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 864  |
|            | tgg<br>Trp<br>290 |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 912  |
|            | aac<br>Asn        |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 960  |
|            | ttc<br>Phe        |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 1008 |
|            | aag<br>Lys        |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 1056 |
| gtt<br>Val | aag<br>Lys        | gcg<br>Ala<br>355 | atg<br>Met | tgg<br>Trp | agg<br>Arg | gag<br>Glu | gcg<br>Ala<br>360 | aag<br>Lys | gag<br>Glu | tgt<br>Cys | atc<br>Ile | tat<br>Tyr<br>365 | gtg<br>Val | gaa<br>Glu | ccg<br>Pro | 1104 |
|            | agg<br>Arg<br>370 |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 1152 |
| tga        |                   |                   |            |            |            |            |                   |            |            |            |            |                   |            |            |            | 1155 |

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<210> 12
<211> 384
<212> PRT
<213> Brassica napus
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<400> 12 Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr 25 20. Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ile Ala Ser 55 Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro 75 70 Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val 90 Leu Thr Gly Val Trp Val Ile Ala His Lys Cys Gly His His Ala Phe Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser 120 Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His 140 135 His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys 155 Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu 185 Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala 205 200 Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu 220 Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu 230 Tyr Arg Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Tyr 245 Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr 265 Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp 280 Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile 295 Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His 315 310 Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala 330 Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val 345 Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro 360

| Asp              | Arg<br>370                       | Gln              | Gly               | Glu             | Lys               | Lys<br>375        | Gly              | Val               | Phe              | Trp               | Tyr<br>380        | Asn              | Asn               | Lys              | Leu               |     |
|------------------|----------------------------------|------------------|-------------------|-----------------|-------------------|-------------------|------------------|-------------------|------------------|-------------------|-------------------|------------------|-------------------|------------------|-------------------|-----|
| <21<br><21       | 0> 1:<br>1> 1:<br>2> DI<br>3> B: | 155<br>NA        | ica 1             | napus           | 5                 |                   |                  |                   |                  |                   |                   |                  |                   |                  |                   |     |
|                  | 0><br>1> Ci<br>2> (:             |                  | . (11!            | 52)             |                   |                   |                  |                   |                  | .·                |                   |                  |                   |                  |                   |     |
| atg              | 0> 1:<br>ggt<br>Gly              | gca              | ggt<br>Gly        | gga<br>Gly<br>5 | aga<br>Arg        | atg<br>Met        | caa<br>Gln       | gtg<br>Val        | tct<br>Ser<br>10 | cct<br>Pro        | ccc<br>Pro        | tcc<br>Ser       | aag<br>Lys        | aag<br>Lys<br>15 | Ser               | 48  |
|                  | acc<br>Thr                       |                  |                   |                 |                   |                   |                  |                   |                  |                   |                   | Pro.             |                   | Phe              |                   | 96  |
| gtc<br>Val       | gga<br>Gly                       | gaa<br>Glu<br>35 | ctc<br>Leu        | aag<br>Lys      | aaa<br>Lys        | gca<br>Ala        | atc<br>Ile<br>40 | cca<br>Pro        | ccg<br>Pro       | cac<br>His        | tgt<br>Cys        | ttc<br>Phe<br>45 | aaa<br>Lys        | cgc<br>Arg       | tcg<br>Ser        | 144 |
| atc<br>Ile       | cct<br>Pro<br>50                 | cgc<br>Arg       | tct<br>Ser        | ttc<br>Phe      | tcc<br>Ser        | tac<br>Tyr<br>55  | ctc<br>Leu       | atc<br>Ile        | tgg<br>Trp       | gac<br>Asp        | atc<br>Ile<br>60  | atc<br>Ile       | ata<br>Ile        | gcc<br>Ala       | tcc<br>Ser        | 192 |
| tgc<br>Cys<br>65 | ttc<br>Phe                       | tac<br>Tyr       | tac<br>Tyr        | gtc<br>Val      | gcc<br>Ala<br>70  | acc<br>Thr        | act<br>Thr       | tac<br>Tyr        | ttc<br>Phe       | cct<br>Pro<br>75  | ctc<br>Leu        | ctc<br>Leu       | cct<br>Pro        | cac<br>His       | cct<br>Pro<br>80  | 240 |
|                  | tcc<br>Ser                       |                  |                   |                 |                   |                   |                  |                   |                  |                   |                   |                  |                   |                  |                   | 288 |
| cta<br>Leu       | acc<br>Thr                       | ggc<br>Gly       | gtc<br>Val<br>100 | tgg<br>Trp      | gtc<br>Val        | ata<br>Ile        | gcc<br>Ala       | cac<br>His<br>105 | gag<br>Glu       | tgc<br>Cys        | ggc<br>Gly        | cac<br>His       | cac<br>His<br>110 | gcc<br>Ala       | ttc<br>Phe        | 336 |
|                  | gac<br>Asp                       |                  |                   |                 |                   |                   |                  |                   |                  |                   |                   |                  |                   |                  |                   | 384 |
| ttc<br>Phe       | ctc<br>Leu<br>130                | ctc<br>Leu       | gtc<br>Val        | cct<br>Pro      | tac<br>Tyr        | ttc<br>Phe<br>135 | tcc<br>Ser       | tgg<br>Trp        | aag<br>Lys       | tac<br>Tyr        | agt<br>Ser<br>140 | cat<br>His       | cga<br>Arg        | cgc<br>Arg       | cac<br>His        | 432 |
| cat<br>His       | tcc<br>Ser                       | aac<br>Asn       | act<br>Thr        | ggc<br>Gly      | tcc<br>Ser<br>150 | ctc<br>Leu        | gag<br>Glu       | aga<br>Arg        | gac<br>Asp       | gaa<br>Glu<br>155 | gtg<br>Val        | ttt<br>Phe       | gtc<br>Val        | ccc<br>Pro       | aag<br>Lys<br>160 | 480 |

| _ | _ | tca<br>Ser        | -   | _ |  | <br>_ |  |  | _          | 528  |
|---|---|-------------------|-----|---|--|-------|--|--|------------|------|
|   | - | acc<br>Thr        |     |   |  |       |  |  |            | 576  |
|   |   | gcc<br>Ala<br>195 |     |   |  |       |  |  |            | 624  |
|   |   | ttc<br>Phe        |     |   |  |       |  |  |            | 672  |
|   |   | tac<br>Tyr        |     |   |  |       |  |  |            | 720  |
|   |   | tac<br>Tyr        |     |   |  |       |  |  |            | 768  |
|   |   | ccg<br>Pro        |     |   |  | Phe   |  |  | tac<br>Tyr | 816  |
|   |   | cac<br>His<br>275 |     |   |  |       |  |  | tgg<br>Trp | 864  |
|   |   | ttg<br>Leu        |     |   |  |       |  |  | atc<br>Ile | 912  |
|   |   | aag<br>Lys        |     |   |  |       |  |  |            | 960  |
|   |   | tcc<br>Ser        | Thr |   |  |       |  |  |            | 1008 |
|   |   | ccg<br>Pro        |     |   |  |       |  |  |            | 1056 |
|   |   | gcg<br>Ala<br>355 |     |   |  |       |  |  |            | 1104 |

qac agg caa ggt gag aag aaa ggt gtg ttc tgg tac aac aat aag tta Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu 375 1155 tga <210> 14 <211> 384 <212> PRT <213> Brassica napus <400> 14 Met Gly Ala Gly Gly Arg Met Gln Val Ser Pro Pro Ser Lys Lys Ser Glu Thr Asp Thr Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr 20 Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser 40 Ile Pro Arg Ser Phe Ser Tyr Leu Ile Trp Asp Ile Ile Ala Ser 55 Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro His Pro Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val 90 Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His His Ala Phe 105 100 Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser 120 Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His 140 135 His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys 150 155 . Lys Lys Ser Asp Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu 170 165 Gly Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu 180 185 Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala Cys His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu 220 215 Gln Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu 230 Phe Arg Tyr Ala Ala Ala Gln Gly Val Ala Ser Met Val Cys Phe Tyr 250 Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp 280 Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile 295 Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His 310 315

| Leu Phe Ser  | Thr Met Pro | His Tyr His        | Ala Met Glu<br>330 | Ala Thr Lys A<br>335                  | la |
|--|-------------|--------------------|--------------------|---------------------------------------|----|
| •  | 340         | 345                |                    | Gly Thr Pro V<br>350                  |    |
| 355  |             | 360                |                    | Tyr Val Glu P<br>365                  |    |
| Asp Arg Gln<br>370                                 | Gly Glu Lys | Lys Gly Val<br>375 | Phe Trp Tyr<br>380 | Asn Asn Lys L                         | eu |
| <210> 15<br><211> 1155<br><212> DNA<br><213> Brass | ica napus   |                    |                    |                                       |    |
| <220><br><221> CDS<br><222> (1)                    | .(1152)     |                    |                    | •                                     |    |
| <400> 15   |             |                    | •                  |                                       |    |
|  |             |                    |                    | tcc aag aag t<br>Ser Lys Lys S<br>15  |    |
|  |             |                    |                    | ccg ccc ttc a<br>Pro Pro Phe T<br>30  |    |
|  | Leu Lys Lys |                    |                    | ttc aaa cgc t<br>Phe Lys Arg S<br>45  |    |
|  |             |                    |                    | atc ata gcc t<br>Ilė Ile Ala S        |    |
|  |             |                    |                    | ctc cct cac c<br>Leu Pro His P        |    |
|  |             |                    |                    | caa ggg tgc g<br>Gln Gly Cys V<br>95  |    |
|  |             |                    |                    | cac cac gcc t<br>His His Ala P<br>110 |    |
|  |             |                    | Val Gly Leu        | atc ttc cac t<br>Ile Phe His S<br>125 |    |
|  |             |                    |                    | cat cga cgc c<br>His Arg Arg H        |    |

|            |  |  |  |  |     | gtg<br>Val        |  |            | 480  |
|------------|--|--|--|--|-----|-------------------|--|------------|------|
|            |  |  |  |  |     | cac<br>His        |  |            | 528  |
|            |  |  |  |  |     | ctc<br>Leu        |  |            | 576  |
|            |  |  |  |  |     | gac<br>Asp        |  | gct<br>Ala | 624  |
|            |  |  |  |  |     | gac<br>Asp<br>220 |  |            | 672  |
|            |  |  |  |  |     | gtc<br>Val        |  |            | 720  |
|            |  |  |  |  |     | atg<br>Met        |  |            | 768  |
|            |  |  |  |  |     | gtg<br>Val        |  |            | 816  |
| ttg<br>Leu |  |  |  |  |     | gat<br>Asp        |  |            | 864  |
|            |  |  |  |  |     | aga<br>Arg<br>300 |  |            | 912  |
|            |  |  |  |  |     | cac<br>His        |  |            | 960  |
|            |  |  |  |  |     | gaa<br>Glu        |  |            | 1008 |
|            |  |  |  |  | Gln | gat<br>Asp        |  |            | 1056 |

| gtt aag gcg a<br>Val Lys Ala 1<br>355               |                    |                 | Lys Glu        |                |                |              |            |
|---|--------------------|-----------------|----------------|----------------|----------------|--------------|------------|
| gac agg caa (<br>Asp Arg Gln (<br>370               |                    |                 |                |                |                |              |            |
| tga   |                    |                 |                |                |                |              | 1155       |
| <210> 16<br><211> 384<br><212> PRT<br><213> Brassic | ca napus           |                 | ·              |                |                |              |            |
| <400> 16<br>Met Gly Ala 0                           | elu Glu Ara        | Met Gln         | Val Ser        | Pro Pro        | Ser Lvs        | Lvs Se       | ar.        |
| met Gry Ara C                                       | 5 5                | Mec GIII        | 10             | 110 110        | Ser bys        | 15           |            |
| Glu Thr Asp T                                       | Thr Ile Lys<br>20  | Arg Val         | Pro Cys<br>25  | Glu Thr        | Pro Pro.       | Phe Th       | nr         |
| Val Gly Glu I                                       | Leu Lys Lys        | Ala Ile<br>40   | Pro Pro        | His Cys        | Phe Lys        | Arg Se       | er         |
| Ile Pro Arg S<br>50                                 | Ser Phe Ser        | Tyr Leu<br>- 55 | Ile Trp        | Asp Ile 60     | Ile Ile        | Ala Se       | er         |
| Cys Phe Tyr 1                                       | -                  | -               | Tyr Phe        |                | Leu Pro        |              |            |
| 65<br>Leu Ser Tyr E                                 |                    |                 |                | 75<br>Ala Cys  | Gln Gly        | Cys Va       | 30<br>al . |
| Leu Thr Gly V                                       |                    | Ile Ala         |                | Cys Gly        |                | 95<br>Ala Pl | ne         |
| Ser Asp Tyr G                                       | l00<br>Sln Trp Leu |                 | 105<br>Thr Val | Gly Leu        |                | His Se       | er         |
| 115<br>Phe Leu Leu V                                | al Pro Tvr         | 120<br>Phe Ser  | Trp Lys        | Tyr Ser        | 125<br>His Arg | Arg Hi       | is         |
| 130   |                    | 135             |                | 140            |                |              | •          |
| His Ser Asn T                                       | hr Gly Ser.<br>150 |                 | Arg Asp        | Glu Val        | Phe Val        |              | /s<br>50   |
| Lys Lys Ser A                                       |                    |                 | Gly Lys        |                | Asn Asn        |              |            |
| Gly Arg Thr V                                       |                    | Thr Val         |                | Thr Leu        | Gly Trp        |              | eu         |
| Tyr Leu Ala F                                       |                    | Ser Gly<br>200  |                | Tyr Asp        |                | Phe Al       | la         |
| Cys His Phe H                                       | lis Pro Asn        |                 | Ile Tyr        | Asn Asp<br>220 |                | Arg Le       | eu         |
| 210<br>Gln Ile Tyr I                                | le Ser Asp         |                 | Ile Leu        |                | Cys Tyr        | Gly Le       | eu         |
| 225   | 230                |                 |                | 235            |                | 24           | 10         |
| Phe Arg Tyr A                                       | 245                |                 | 250            |                |                | 255          |            |
| Gly Val Pro I                                       | eu Leu Ile<br>:60  | Val Asn         | Gly Phe<br>265 | Leu Val        | Leu Ile<br>270 | Thr Ty       | yr<br>·    |
| Leu Gln His T<br>275                                |                    | Ser Leu<br>280  | •              | Tyr Asp        |                | Glu Ti       | <b>p</b>   |

| As | -        | Trp<br>290   |            | Arg        | Gly        | Ala        | Leu<br>295 |            | Thr        | Val        | Asp        | Arg<br>300 | Asp        | Tyr        | Gly        | Ile        |     |
|----|----------|--------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-----|
|    |          |              |            | Val        | Phe        | His<br>310 |            | Ile        | Thr        | Asp        | Thr<br>315 |            | Val        | Ala        | His        | His<br>320 |     |
|    |          | Phe          | Ser        | Thr        | Met<br>325 | Pro        | His        | Tyr        | His        | Ala<br>330 | Met        |            | Ala        | Thr        | Lys<br>335 | Ala        |     |
| IJ | .e       | Lys          | Pro        | Ile<br>340 |            | Gly        | Glu        | Tyr        | Tyr<br>345 | Gln        | Phe        | Asp        | Gly        | Thr<br>350 | Pro        | Val        |     |
| Va | 1        | Lys          | Ala<br>355 |            | Trp        | Arg        | Glu        | Ala<br>360 | _          | Glu        | Cys        | Ile        | Tyr<br>365 | Val        | Glu        | Pro        |     |
| As | -        | Arg<br>370   | Gln        | Gly        | Glu        | Lys        | Lys<br>375 |            | Val        | Phe        | Trp        | Tyr<br>380 | Asn        | Asn        | Lys        | Leu        | ·   |
|    |          | > 17         |            |            |            |            |            |            |            |            |            |            |            |            |            |            |     |
| <2 | 12       | > 11<br>> Di | A          |            |            |            |            |            |            |            |            |            |            |            |            |            |     |
| <2 | :13      | > Bı         | cass:      | ica 1      | napu       | S .        |            |            |            |            |            |            |            |            |            |            |     |
|    | 20<br>21 | ><br>> CI    | os         |            | •          |            |            |            |            |            |            | •          |            |            |            |            |     |
|    |          |              |            | . (11      | 52)        |            |            |            |            |            | •          |            |            |            |            |            |     |
|    |          | > 17         |            | •          | •          |            |            |            |            |            |            |            |            |            |            |            | 10  |
|    |          |              |            |            |            | aga<br>Arg |            |            |            |            |            |            |            |            |            |            | 48  |
|    |          |              |            |            |            |            |            |            |            |            |            |            |            |            |            | act        | 96  |
| G1 | u '      | Thr          | Asp        | Thr<br>20  | He         | гуs        | Arg        | Val        | 25         | Cys        | GIU        | Tnr        | Pro        | 30         | Pne        | Thr        |     |
|    |          |              |            |            |            | aaa        |            |            |            |            |            |            |            |            |            |            | 144 |
| Va | 1 '      | Gly          | Glu<br>35  | Leu        | Lys        | Lys        | Ala        | Ile<br>40  | Pro        | Pro        | His        | Cys        | Phe<br>45  | Lys        | Arg        | Ser        | •   |
|    |          |              |            |            |            | tcc        |            |            |            |            |            |            |            |            |            |            | 192 |
| 11 | е.       | 50           | Arg        | ser        | rne        | Ser        | 55         | ьeu        | ııe        | 11p        | Asp        | 60         | 116        | ıńe        | Λια        | 261        |     |
|    |          |              |            |            |            | gcc        |            |            |            |            |            |            |            |            |            |            | 240 |
|    | s :      | Phe          | Tyr        | Tyr        | val        | Ala<br>70  | Inr        | inr        | Tyr        | rne        | 75         | Leu        | Leu        | PIO        | HIS        | 80         |     |
|    |          |              |            |            |            | tgg<br>Trp |            |            |            |            |            |            |            |            |            |            | 288 |
| De | u        | SEI          | ıyı        | rne        | 85         | 110        | 110        | ПСИ        |            | 90         |            | 0,10       | 01         | 017        | 95         |            |     |
|    |          |              |            |            |            | gtc<br>Val |            |            |            |            |            |            |            |            |            |            | 336 |
| те | u :      | me           | άΤλ        | 100        | тр         | val        | 116        | VTG        | 105        | GIU        | Суз        | •          | 1173       | 110        | a          | T 11C      |     |
|    |          |              |            |            |            | ctt<br>Leu |            |            |            |            |            |            |            |            |            |            | 384 |
| se |          | мзр          | 115        | GIU        | ттр        | ьеи        | nsp        | 120        | THE        | val        | GIÅ        | neu        | 125        | r 116      | ****       | 561        |     |

|                   |                   |            |            |                   |                   |                   |            | <b>.</b>   |                   | <b>.</b>          |                   |            |            |                   |                   |   | 422  |
|-------------------|-------------------|------------|------------|-------------------|-------------------|-------------------|------------|------------|-------------------|-------------------|-------------------|------------|------------|-------------------|-------------------|---|------|
|                   |                   | Leu        |            | cct<br>Pro        |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |   | 432  |
|                   |                   |            |            | ggc<br>Gly        |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |   | 480  |
|                   |                   |            |            | atc<br>Ile<br>165 |                   |                   |            |            |                   |                   |                   |            |            |                   |                   | • | 528  |
|                   |                   |            |            | atg<br>Met        |                   |                   |            |            |                   |                   |                   |            |            |                   |                   | • | 576  |
|                   |                   |            |            | aac<br>Asn        |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |   | 624  |
|                   |                   |            |            | ccc<br>Pro        |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |   | 672  |
| cag<br>Gln<br>225 | ata<br>Ile        | tac<br>Tyr | atc<br>Ile | tcc<br>Ser        | gac<br>Asp<br>230 | gct<br>Ala        | ggc<br>Glý | atc<br>Ile | ctc<br>Leu        | gcc<br>Ala<br>235 | gtc<br>Val        | tgc<br>Cys | tac<br>Tyr | ggt<br>Gly        | ctc<br>Leu<br>240 | • | 720  |
|                   |                   |            |            | gcc<br>Ala<br>245 |                   |                   |            |            |                   |                   |                   |            |            |                   |                   |   | 768  |
|                   |                   |            |            | ctg<br>Leu        |                   |                   |            |            |                   |                   |                   |            |            |                   | tac<br>Tyr        |   | 816  |
|                   |                   |            |            | cat<br>His        |                   |                   |            |            |                   |                   |                   |            |            |                   | tgg.<br>Trp       |   | 864  |
| gat<br>Asp        | tgg<br>Trp<br>290 | ttg<br>Leu | agg<br>Arg | gga<br>Gly        | gct<br>Ala        | ttg<br>Leu<br>295 | gct<br>Ala | acc<br>Thr | gtt<br>Val        | gac<br>Asp        | aga<br>Arg<br>300 | gac<br>Asp | tac<br>Tyr | gaa<br>Glu        | atc<br>Ile        |   | 912  |
| ttg<br>Leu<br>305 | aac<br>Asn        | aag<br>Lys | gtc<br>Val | ttc<br>Phe        | cac<br>His<br>310 | Asn               | att<br>Ile | acc<br>Thr | gac<br>Asp        | acg<br>Thr<br>315 | cac<br>His        | gtg<br>Val | gcg<br>Ala | cat<br>His        | cat<br>His<br>320 | - | 960  |
| ctg<br>Leu        | ttc<br>Phe        | tcc<br>Ser | acg<br>Thr | atg<br>Met<br>325 | ccg<br>Pro        | cat<br>His        | tat<br>Tyr | cac<br>His | gcg<br>Ala<br>330 | atg<br>Met        | gaa<br>Glu        | gct<br>Ala | acc<br>Thr | aag<br>Lys<br>335 | gcg<br>Ala        |   | 1008 |

| ata<br>Ile     | aag<br>Lys                       | ccg<br>Pro        | ata<br>Ile<br>340 | ctg<br>Leu | gga<br>Gly | gag<br>Glu | tat<br>Tyr        | tat<br>Tyr<br>345 | cag<br>Gln        | ttc<br>Phe | gat<br>Asp | ggg<br>Gly        | acg<br>Thr<br>350 | ccg<br>Pro | gtg<br>Val | 1056 |
|----------------|----------------------------------|-------------------|-------------------|------------|------------|------------|-------------------|-------------------|-------------------|------------|------------|-------------------|-------------------|------------|------------|------|
| gtt<br>Val     | aag<br>Lys                       | gcg<br>Ala<br>355 | atg<br>Met        | tgg<br>Trp | agg<br>Arg | gag<br>Glu | gcg<br>Ala<br>360 | aag<br>Lys        | gag<br>Glu        | tgt<br>Cys | atc<br>Ile | tat<br>Tyr<br>365 | gtg<br>Val        | gaa<br>Glu | ccg        | 1104 |
|                |                                  |                   |                   |            |            |            | ggt<br>Gly        |                   |                   |            |            |                   |                   |            | tta<br>Leu | 1152 |
| tga            |                                  |                   |                   |            |            |            |                   |                   |                   |            |            |                   |                   |            |            | 1155 |
| <211<br><212   | )> 18<br>L> 38<br>2> PI<br>B> Bi | 34<br>RT          | ica r             | napus      | 3          |            | -                 |                   |                   |            |            |                   |                   |            |            |      |
| -400           | )> 18                            |                   |                   |            |            |            | •                 |                   |                   |            | -          |                   | `                 | •          | ٠.         |      |
|                |                                  |                   | Gly               | Gly<br>5   | Arg        | Met        | Gl'n              | Val               | Ser<br>10         | Pro        | Pro        | Ser               | Lys               | Lys<br>15  | Ser        |      |
|                |                                  | _                 | .20               | •          |            |            | Val               | 25                |                   |            |            |                   | 30                |            |            |      |
|                | -                                | 35                |                   |            |            |            | 11e<br>40         |                   |                   |            |            | 45                |                   |            | •          |      |
|                | 50                               | _                 |                   |            |            | 55         | Leu               | •                 |                   |            | 60         |                   |                   |            |            |      |
| Cys<br>65      | Phe                              | Tyr               | Tyr               | Val        | Ala<br>70  | Thr        | Thr               | Tyr               | Phe               | Pro<br>75  | Leu        | Leu               | Pro               | His        | Pro 80     |      |
|                | Ser                              | Tyr               | Phe               | Ala<br>85  | Trp        | Pro        | Leu               | Tyr               | Trp<br>90         | Ala        | Cys        | Gln               | Gly               | Cys<br>95  | Val        |      |
| Leu            | Thr                              | Gly               | Val<br>100        | Trp        | Val        | Ile        | Ala               | His<br>105        | Glu               | Cys        | Gly        | His               | His<br>110        | Ala        | Phe        |      |
|                |                                  | 115               |                   | _          |            |            | Asp<br>120        |                   |                   |            |            | 125               |                   |            |            |      |
|                | 130                              |                   |                   |            | *          | .135       | Ser               |                   |                   |            | 140        |                   |                   | •          |            |      |
|                | Ser                              | Asn               | Thr               | Gly.       | Ser<br>150 | Leu        | Glu               | Arg               | Asp               | Glu<br>155 | Val        | Phe               | Val               | Pro        | Lys<br>160 |      |
| 145<br>Lys     | Lys                              | Ser               | Asp               | Ile        |            | Trp        | Tyr               | Gly               | Lys               |            | Leu        | Asn               | Asn               | Pro        |            |      |
| <del>-</del> . |                                  |                   |                   | 165        |            |            |                   |                   | 170               |            |            |                   |                   | 175        |            |      |
|                |                                  |                   | 180               |            |            |            | Val               | 185               |                   |            |            |                   | 190               |            |            |      |
| _              |                                  | 195               |                   |            |            |            | Gly<br>200        |                   |                   |            |            | 205               |                   |            |            |      |
| -              | 210                              |                   |                   |            |            | 215        |                   |                   |                   |            | .220       |                   |                   |            | Leu        |      |
| Gln<br>225     | Ile                              | Tyr               | Ile               | Ser        | Asp 230    | Ala        | Gly               | Ile               | Leu               | Ala<br>235 | уат        | cys               | Tyr               | стА        | Leu<br>240 |      |
| Phe.           | Arg                              | Tyr               | Ala               | Ala<br>245 |            | Gln        | Gly               | Val               | <b>Ala</b><br>250 |            | Met        | Val               | Cys               | Phe<br>255 | Tyr        |      |
|                |                                  |                   |                   |            |            |            |                   |                   |                   |            |            |                   |                   |            |            |      |

```
Gly Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr
                                 265
            260 ·
Leu Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp
                            280
Asp Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Glu Ile
                        295
Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His
                    310
                                         315
Leu Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala
                325
                                     330
Ile Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val
                                345
Val Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro
                             360
Asp Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu
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                                                                         21
tctttcacca tcatcatatc c
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                                                                         21
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| <400> 23                                 |     |    |
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|  |     |    |
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| <223> primer                             |     |    |
| veedy parmer                             |     |    |
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|  |     |    |
| <210> 26                                 |     |    |
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| <220>                                    |     |    |
| <223> primer                             |     |    |
| cases brames                             | . • |    |
| <400> 26                                 |     |    |
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|  |     |    |
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Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser Phe
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